

## ABSTRACT

**[0056]** A method of constraining a stochastic model of Gaussian or related type, representing a porous medium such as an underground reservoir, to data characteristic of the displacement of the fluids is disclosed. The method is based on an iterative development in two stages. The first stage carries out a flow simulation, in identifying zones inside the reservoir and in estimating the modification to be brought to the effective permeabilities of these zones so as to improve calibration between the real data and the corresponding responses obtained with the flow simulator. The second stage involves an intermediate optimization problem intended to minimize an intermediate objective function (implemented from a gradual deformation technique) measuring the difference between the effective permeabilities calculated for the zones and the effective permeabilities identified during the first stage for better calibration.